Building for Bio

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Biotech is getting buy-in from a host of private investors and public agencies that recognize the ability of biotechnology research to create healthier economies and healthier populations.

Since the 1970s, the biotechnology industry has been solving some of America's most pressing problems by creating everything from medical therapies to systems for reduction of energy use and waste. In the past decade, the industry has also been instrumental in bringing together strategic partnerships that are rebuilding local economies. Biomedical research institutions such as universities, nonprofit groups, and medical organizations have been driving a range of development alliances that have generated new projects around the world.

Academic institutions need more laboratory space to do better research and to do it more quickly, but also to gain greater returns on their investments. More and more developers are helping these institutions build specialized facilities and incubator spaces for the startup companies that universities spin off. Additional impetus has come from state governments, which are investing in this market to create new jobs and reinvigorate underperforming economies.

The Piedmont Triad Research Park in Winston-Salem, North Carolina, includes the Greenpark and the *Triple Helix* sculpture (center); One Technology Place, home to Targacept, a biopharmaceutical company; and the Piedmont Triad Community Research Center, which contains two of the research park's first tenants—the Wake Forest University Health Sciences departments of physiology and pharmacology, and Winston-Salem State University's Project Strengthen.

Such activity illustrates how universities and industry, working together, have found ways to capitalize on the shift from an industrial economy to one that is knowledge based. "Research can build new business, but universities need ways to capture and commercialize their knowledge," explains Bill Dean, director of the Piedmont Triad Research Park in Winston-Salem, North Carolina, and past president of the Association of University Research Parks (AURP). "To move ideas forward, universities need to build environments that can sustain innovation. The key is to balance the fast-paced culture of business, which is interested in the bottom line, with the culture of academia, which is focused on education and the development of new ideas."

Much has changed since the birth of Research Triangle Park, one of the first research parks in the United States. Created in 1959 near Raleigh, North Carolina, it was designed as a research and development center for three universities—the University of North Carolina at Chapel Hill, Duke University, and North Carolina State University. Today, encompassing 7,000 acres (2,800 ha) that contain more than 20 million square feet (1.86 million sq m) of space for about 150 companies, it is one of the largest science parks in the country.

NEW YORK CITY ECONOMIC DEVELOPMENT CORPORATION/RMJM HILLIER

The East River Science Park, the first research and development campus in New York City, will allow new biotech companies to establish a presence in the city and enable existing companies to expand their operations.

Yet this kind of development requires patience. As is the case with any private development, it takes time to plan and build incubator facilities and for them to secure tenants; they rarely reap rewards overnight. Tenants of these facilities have specific needs. Many researchers come from academia, and they demand higher-quality design and fit-out than is common for speculative office space. Accreditation from the Leadership in Energy and Environmental Design (LEED) green building program is expected in order for facilities to attract new companies. This is not easy to achieve because research consumes a large amount of energy.

Still, the number of university-related research developments has been increasing in suburban and urban locations throughout the United States, especially in California, Florida, Massachusetts, New York, and Texas. Much of this development is happening in downtown areas, where universities have historically located their medical schools. Particular hot spots are Baltimore, Boston, Philadelphia, San Diego, and San Francisco, all of which are home to numerous universities and research institutions that are fueling this growth.

One of the novel examples of recent biotech development is the East River Science Park (ERSP) in New York City, which is being developed on city-owned property by a public development agent, the New York City Economic Development Corporation (NYCEDC). Currently under construction, the ERSP ultimately will contain 1.1 million square feet (102,000 sq m) of office and laboratory space. Lenzie Harcum, vice president for business development, bioscience, at NYCEDC, believes the project will address the fact that New York City lacks biotechnology incubator space despite the presence of 11 major academic research institutions. He maintains that the ERSP will "diversify the local economy, create high-paying jobs, and help the city to recruit and retain top scientists and businesses that want to reinforce their relationships with these academic centers."

According to *Characteristics and Trends in North American Research Parks: 21st Century Directions*, a 2007 study by Battelle Technology Partnership Prac-

The Science + Technology Park at Johns Hopkins is part of an 88-acre (36-ha) redevelopment project in east Baltimore, Maryland. At full buildout, the park will include research laboratory buildings—among them the John G. Rangos, Sr., Building—and corporate office space, as well as housing and retail space.

tice in cooperation with AURP, university research parks in the United States and Canada account for 124 million square feet (11.5 million sq m) of space and have room to add another 150 million square feet (13.9 million sq m).

As the ERSP illustrates, incentives from the public sector have enabled—and accelerated—this growth. An important milestone was the Bayh-Dole Act, passed in 1980, that allowed universities to profit from research developed under federally funded programs. The legislation even goes so far as to encourage commercialization of drugs and therapies created by university researchers, which in turn has instigated many academic researchers to establish their own biotech companies.

Whereas biotechnology was once considered a risky investment, the private sector now realizes it is a viable place to put money, with banks and other funding sources much more willing now than in the past to invest in specialized facilities for research. A small but growing number of private developers are leading the market in this area, including San Diego, California–based Phase 3 Properties; Pasadena, California–based Alexandria Real Estate Equities Inc. (investors in the ERSP); and Cambridge, Massachusetts–based Forest City Science + Technology Group. Venture capital companies are also targeting startup biotech companies.

Most significant, both public and private agencies recognize that biotech is a proven tool for economic development. This is especially true for cities that once depended on manufacturing for their livelihoods, because biotech has the ability to boost employment. The Battelle and AURP report estimates that every job in a research park creates 2.57 additional jobs for the local economy.

For this reason, some universities and local governments are partnering on biotechnology developments as a way to initiate urban renewal. One example is the Science + Technology Park at Johns Hopkins, which is part of an 88-acre (36-ha) redevelopment project in east Baltimore, Maryland. The first research building of Phase I was completed in April, and the full buildout of the park will include laboratory buildings and corporate office space, as well as housing, retail facilities, and parking. Partners on the project are the city, Maryland, and a consortium of private developers that includes Forest City and Baltimore-based Presidential Partners. A promotional Web site promises that the project will add 6,000 local jobs.

The East River Science Park has drawn a number of public and private investments, including $700 million from Alexandria Real Estate Equities, $13.4 million in capital funds from New York City, and $27 million from

Research Parks to Watch

DEVELOPMENT TO ACCOMMODATE the biosciences is occurring in all 50 states, but there is no standard model for success. As the following list illustrates, the fastest-growing parks offer state-of-the-art space for research, proximity to and direct support from universities, and a host of amenities, from housing to golf courses. Some parks are working directly with government agencies and private investors to boost regional growth. The quality of these developments is also improving, as research parks compete for tenants and investors that have an increasing number of options from which to choose.

Centennial Campus, Raleigh, North Carolina
To solve the problem of expansion and accommodate growth in the biosciences, North Carolina State University created Centennial Campus as a series of pedestrian-oriented neighborhoods on 1,334 acres (540 ha), including its recent extension, the Centennial Biomedical Campus. The multidisciplinary village integrates academic programs and research, private businesses of all sizes, and government agencies. Located on the live/work campus near Raleigh are a middle school, housing, retail space, an executive conference center and hotel, recreational areas, and a golf course.

Center of Research, Technology, and Entrepreneurial Exchange, St. Louis, Missouri
A nonprofit group composed of institutions that conduct life sciences research—including the Washington University School of Medicine, St. Louis University, the University of Missouri at St. Louis, Barnes-Jewish Hospital, and the Missouri Botanical Garden—joined forces to create the Center of Research, Technology, and Entrepreneurial Exchange (CORTEX). The park is helping expand the local biotech industry and redevelop 250 acres (100 ha) of a former manufacturing and distribution area located west of downtown.

East River Science Park, New York, New York
The groundbreaking for the first phase of the East River Science Park took place in October 2007, positioning the park to become the first major hub of biotech research in New York City when it opens in 2010 to 2011. The 1.1 million-square foot (102,000-sq-m) complex will contain office and laboratory space on a 3.5-acre (1.4-ha) site. The New York City Economic Development Corporation is hoping to draw new and existing biotech companies and to provide a resource for local academic research institutions and research centers.

Central Florida Research Park, Orlando, Florida
Located next to the University of Central Florida (UCF), 12 miles (19 km) from Orlando, the Central Florida Research Park is home to a number of UCF organizations and employs 400 students and graduates. Other tenants include divisions of the U.S. Army and U.S. Navy and more than 100 businesses. Companies can either purchase land on which to build new facilities or lease space for research and light manufacturing. The 1,027-acre (416-ha) campus contains a total of 48 buildings, including 11 hotels.

East Campus at the University at Albany, Greenbush, New York
The University at Albany Foundation owns and operates East Campus at the University at Albany, a former pharmaceutical complex that was converted into a high-tech hub. In addition to the New York state–funded Center for Excellence in Cancer Genomics, the campus is home to a mix of established and startup biotech companies and a business incubator. Because the research park is located in a New York State Empire Economic Development Zone, businesses benefit from tax breaks and other incentives.

Mission Bay, San Francisco, California
Downtown San Francisco is home to Mission Bay, a biomedical research campus for the University of California at San Francisco (UCSF). The campus is located on 57.5 acres (23 ha) of land donated to the university as part of a redevelopment scheme for a former rail yard. In addition to four bioscience laboratory buildings, housing, a community center, and a child care center, UCSF plans to build a hospital complex near the campus and space for private biotech companies. Full buildout is expected in 2020.

San Diego Biotechnology Cluster, San Diego, California
One of the greatest concentrations of biotech companies in the country makes up the San Diego Biotechnology Cluster, which contributes $8.5

billion annually to the local economy. Organizations present include the Salk Institute, the Scripps Research Institute, the Burnham Institute, the University of California at San Diego, San Diego State University, and San Diego City College. Local universities and research institutions have been responsible for creation of about 200 new biotech firms in the region.

Science Center at University City, Philadelphia, Pennsylvania
The Science Center at University City was established in 1963 as a joint venture between the University of Pennsylvania and Drexel University to promote biotech research in west Philadelphia. One of the oldest and largest urban incubator parks, the Science Center is located on 17 acres (6.9 ha) and contains 2 million square feet (186,000 sq m) of space for 32 academic and research institutions and almost 200 companies. Current expansion plans will add 1.5 million square feet (139,000 sq m) of space to the campus.

Texas Research Park, San Antonio, Texas
The Texas Research and Technology Foundation is the developer of the Texas Research Park, one of the most developed bioscience research parks in the state. The 1,236-acre (500-ha) park, located in western San Antonio, is home to two institutes of the University of Texas Health Science Center at San Antonio—the Institute for Biotechnology and the Institute for Longevity and Aging Studies. A variety of other tenants are also located there, including biomanufacturing firms and TEKSA Innovations Corp., a for-profit high-tech and biotech business incubator.

University of Arizona Science and Technology Park, Tucson, Arizona
The University of Arizona Science and Technology Park spreads over 1,345 acres (544 ha) in southeast Tucson. Its 2 million square feet (186,000 sq m) of built space contains offices, research and development facilities, and laboratories, including the Arizona Center for Innovation, a business incubator, and the Center for Technology Commercialization. The science and technology park will soon add the Arizona Bioscience Park, which is targeted to the biosciences, biotechnology, life sciences, and pharmaceuticals industries. It will also include a hotel and conference center, retail space, and residences.

University Park at the Massachusetts Institute of Technology, Cambridge, Massachusetts
University Park at the Massachusetts Institute of Technology (MIT) contains 1.3 million square feet (121,000 sq m) of research and office space in ten buildings. The 27-acre (11-ha) urban redevelopment project also included construction of four residential buildings, a hotel and conference center, and a range of amenities, from restaurants to health clubs. University Park was developed jointly by MIT, Forest City Enterprises, and the city of Cambridge. The park won an Urban Land Institute 2004 Award for Excellence.—J.M.D.

the state for infrastructure work in connection with the project, in addition to funding from the New York City Investment Fund, the New York City Industrial Development Agency, and the U.S. Department of Commerce's Economic Development Administration.

Not all research-related developments are so ambitious—or need to be. The models are diverse. Private companies often develop single research buildings or develop facilities in partnership with a university, or a university and developer may work with state and city agencies, as is the case in Baltimore. Sometimes, a nonprofit entity may be designated to coordinate the development and management of a research park; at other times, an institution may choose to develop new properties one at a time, with financing from either the private sector or the institutional side.

Neil Fox, a developer who has been working in the biotechnology market since 1988, founded Phase 3 Properties in 2000. The company is now working on projects across the country, from Hawaii to New York. "Private developers, who are constrained by market conditions, can help universities to build more cost-effectively and assume a large part of the risk for new research space," he says.

Developers are increasingly building speculative research space for startup businesses without an anchor pharmaceutical tenant, as had been the model in the past. They are hoping to capture the momentum from research coming out of universities by providing top-notch incubator space for new businesses. For example, Phase 3 converted a former hospital into the 108,000-square-foot (10,000-sq-m) San Diego Science Center, dividing it into offices as small as 2,000 square feet (186 sq m). The building offers more than just move-in laboratory space: Phase 3 equipped the incubator facility with a number of shared amenities that can help young biotech companies succeed, such as conference facilities and core lab facilities, as well as a cafeteria and a health club.

Indeed, many developers realize that small perks can be a big draw for young companies. To entice new businesses, the University Technology Park in Chester, Pennsylvania, offers reduced-rate telephone and Internet service, as well as access to library resources at Widener University, which jointly developed the tech park with the Crozer-Keystone Health System, a longtime collaborative partner. The two institutions created

Starting Up Incubators

BIOTECH BUSINESS INCUBATORS are buildings that help accommodate the transfer of research from academic institutions to the commercial market by addressing the special needs of small startup companies. Incubator buildings typically include customized spaces that facilitate ongoing scientific study, as well as specific services that promote the commercialization of promising research.

Most often, incubators are located near academic research hubs and act as extensions of these hubs. This proximity is advantageous for owners because it appeals to new startup companies that come out of such institutions. It also benefits the startups by making them more visible to the venture capital and private equity organizations that are most likely to fund them. Some incubators receive government funding or tax reductions that they can pass on to small companies in the form of financial incentives or rent subsidies.

Many incubator buildings are designed to reflect the research activities that take place within them. Young, forward-looking companies look for buildings that support their goals and mission, so incubator buildings are almost always certified as environmentally friendly under the Leadership in Energy and Environmental Design (LEED) green building program because sustainable design attracts such tenants.

Because biotech companies are engaged in cutting-edge research, building designs typically advertise technology as a metaphor for the work of resident companies. High-tech materials such as metal cladding and porcelain tile are common, as are large areas of glass. Glazing, atriums, and skylights are especially prevalent because they allow plenty of natural light to enter the public spaces where researchers often meet. Other features can further enhance the feeling of collaboration, such as open stairways where researchers from different companies can interact. To ensure safety, these and other primary circulation areas are segregated from the service access corridors.

It is important that buildings be able to support the transitional steps that startup biotech companies take as they develop commercially viable products. This process includes research, then testing, and finally small-scale production of therapies to ready them for clinical trials. Provision of wet labs, equipment labs, office spaces, and all the basic services and infrastructure should nurture this development.

Floors typically are divided into the small suites that are most economical for startup firms, yet the buildings have to be large and flexible enough to allow companies to expand incrementally over time. Since the early part of this decade, the private equity community has become increasingly conservative, which has limited the amount of seed money available to young companies. As a result, startups often want to stay in incubators longer than they did previously. To retain tenants, an incubator should be capable of supporting their expansion.

The key goal is to achieve the right mix of labs and infrastructure that will make an incubator competitive in the marketplace while keeping the tenants' costs low. Incubators typically provide companies with shared utilities, such as chilled water, purified water, steam, and compressed air. Other common services are glass washes, where laboratory glassware is cleaned; autoclave rooms, where equipment is sterilized to prevent microbial contamination in the labs; and vivariums, where laboratory animals are housed. Because companies within the same building are often engaged in various types of research and may require different and incompatible services, it sometimes is difficult to provide centralized utilities for all firms.

Companies that want to move aggressively toward commercialization require sophisticated infrastructure to support animal testing and small-scale production. During these stages, companies must be able to monitor their own utilities and services—gases, liquids, or equipment—as required for approval by the U.S. Food and Drug Administration. For this reason, many buildings provide tenant spaces that incorporate individually controlled utilities. Some buildings have a central pilot plant suite that can be shared among tenants but is operated by an independent third party.

In addition to laboratory space, offices, and utilities, it is becoming more common for incubators to incorporate communal services and amenities that help young biotech companies operate their businesses. Conference centers with state-of-the-art videoconference capabilities, cafeterias, and fitness centers are the kind of perks that attract new companies. Some owners offer extras, such as business planning and legal services, that give young companies all they need to get off the ground.—J.M.D.

DON PEARSE PHOTOGRAPHERS INC./FRANCIS CAUFFMAN ARCHITECTS

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WARNER A. BONNER/PHASE 3 PROPERTIES

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A hospital was converted into the San Diego Science Center, which contains a mix of laboratories, offices, and shared support spaces that accommodate startup biotech businesses and provide room for tenant expansion (above and top).

The University Technology Park in Chester, Pennsylvania, supports activities related to Widener University and Crozer-Keystone Health System, which jointly developed the project on a 20-acre (8.1-ha) parcel of land located between them (left and top left). It also houses private firms that specialize in technology, research, and small manufacturing.

the technology park together, transforming a 20-acre (8.1-ha) parcel of land between them to support their activities and entice private firms that specialize in technology, research, and small manufacturing.

The partners also shared the goal of creating a new economic base for the manufacturing town. The University Technology Park received funding from Pennsylvania's Keystone Opportunity Zone program, which reduces specific state and local taxes in an effort to spur development in underused areas. The federal government offered support through the Economic Development Administration.

Though to some observers, New York City's investment in the East River Science Park might seem to be an uncertain proposition, proof exists that this kind of investment can pay off. Wake Forest University recently took a calculated risk when it helped create the Piedmont Triad Research Park. Universities, research organizations, and businesses joined forces, hoping to revive Winston-Salem, which was once known for furniture and textiles, but had suffered huge job losses.

The initial impetus to expand the Piedmont Triad Research Park came from the North Carolina Emerging Technology Alliance, a group of academic, business,

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The Richard H. Dean Biomedical Research Facility at Piedmont Triad Research Park in Winston-Salem, North Carolina, is a 180,434-square-foot (16,763-sq-m) building that is home to the Wake Forest University Institute for Regenerative Medicine and the Lipid Sciences Research Program, as well as the regional office of the North Carolina Biotechnology Center. It includes the Wet Lab LaunchPad, which helps young companies develop prototypes for commercialization (left and bottom left).

and government leaders, and the Winston-Salem Downtown Development Corporation. Ten years ago, Wake Forest University started planning for a 12-acre (4.9-ha) site in downtown Winston-Salem and brought in a private developer, Greensboro, North Carolina–based Samet Corporation, to develop an initial building. Since then, Wake Forest University Health Sciences has led an initiative to expand the research park and has drawn many investors, making it possible to amass 230 acres (93 ha) for future growth on its original site and two additional locations in downtown Winston-Salem.

Dean attributes the success of the research park to Wake Forest's ability to "turn scientific ideas into enterprises that create a pipeline for the local economy and into technologies that foster the betterment of the global population at large." Clearly, biotech is getting buy-in from a host of private investors and public agencies that recognize the ability of biotechnology research to create healthier economies and healthier populations.

In the future, even more players may get into the game. Pharmaceutical companies are one likely candidate because they are always looking for promising research to supplement their own pipelines. Down the road, they may find it is more cost-effective to develop new incubator facilities for university-based investigations than to subsidize research and development for new drug therapies in-house.

While universities will continue to generate ideas and look for ways to develop new space, they will continue to need support from the public sector to fund new research programs—mostly through grants from the National Institutes of Health—and creative streams of government investment for laboratory facilities. In fact, certain states have used settlement money from the tobacco industry or attempted to pass bond initiatives, which have been most successful in California (for stem cell research) and Texas (for cancer research). Perhaps more government agencies will take cues from the private sector, which has already proven that building for biotech can be good business. **UL**

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